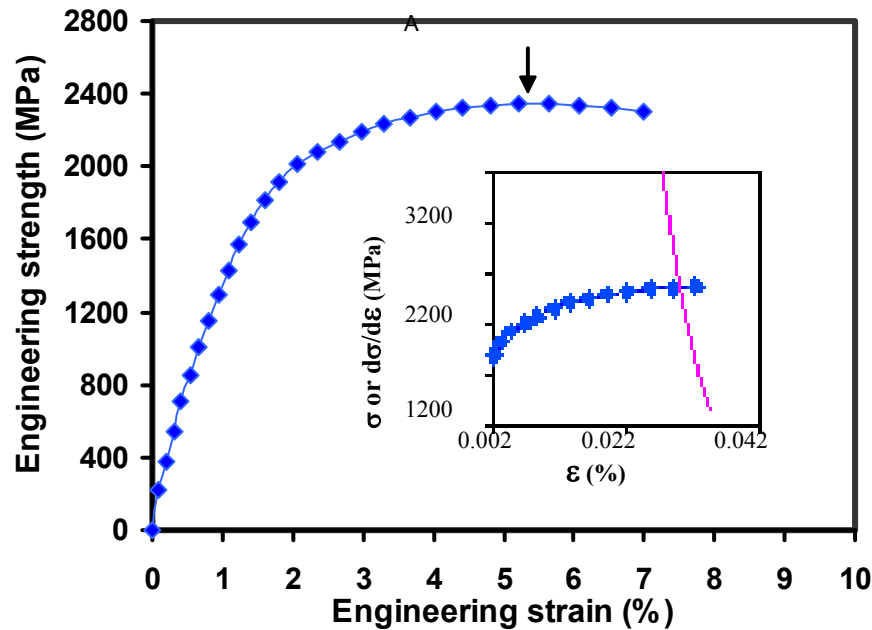


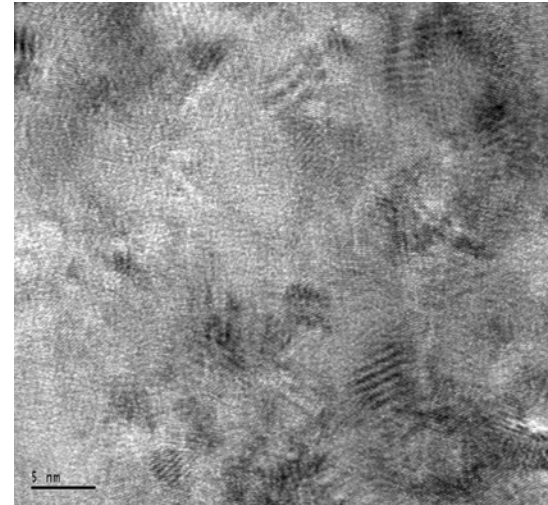
Deformation and Fracture of Nanocrystalline Metals

Fereshteh Ebrahimi, University of Florida, DMR Award # 9980213

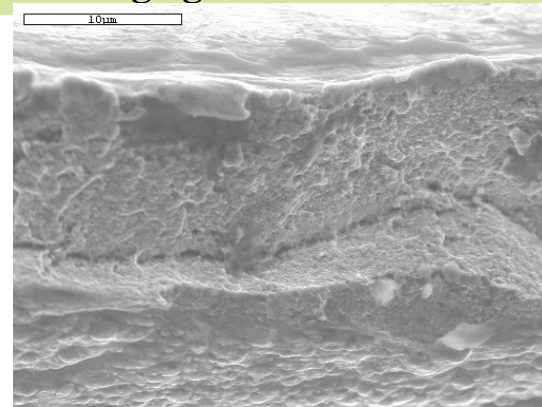


Tensile engineering stress-strain curve

- First time report of high strength and large tensile elongation in nanocrystalline FCC metals.
- Plastic deformation occurs via dislocation emission from grain boundaries as well as grain boundary sliding.



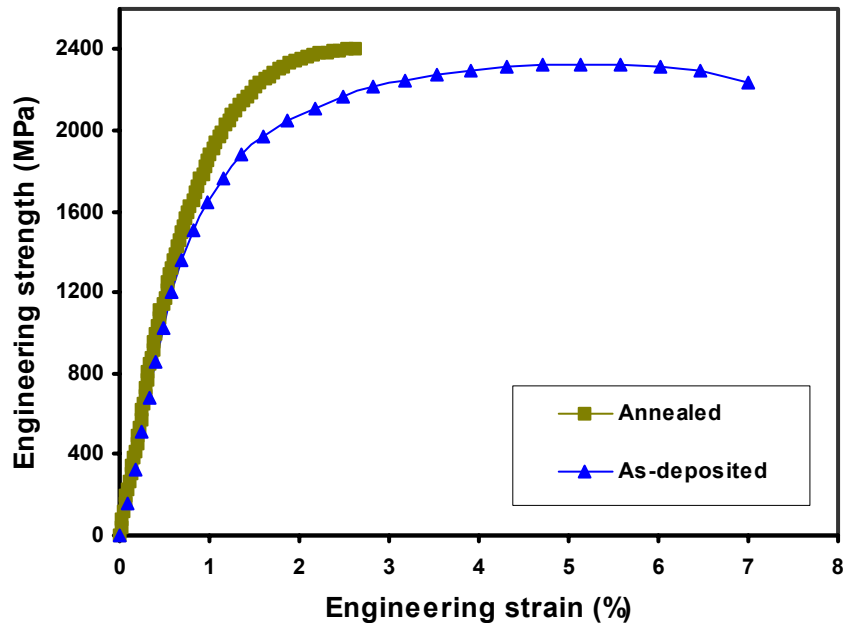
High Resolution TEM
Average grain size = 8.8 nm



Ductile fracture behavior under
plane-stress condition

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➤ Annealing at 250°C resulted in an increase in the yield strength and significant decrease in the uniform elongation in spite of the increase in the mean grain size from 8.8nm to 14nm..

➤ These changes are attributed to the relaxation of grain boundaries, which make dislocation emission and grain boundary sliding more difficult.

Publications

1. H. Li and F. Ebrahimi, "An Investigation of Thermal Stability and Microhardness of Electrodeposited Nanocrystalline Ni-21%Fe Alloys," *Acta Materialia*, 2003, Vol. 51, pp. 3905-3913.
2. F. Ebrahimi and H. Li, "Structure and Properties of Electrodeposited Nanocrystalline FCC Ni-Fe Alloys," *Rev. Adv. Mater. Sci*, 2003, Vol. 4, 1118-1122.
3. H. Li and F. Ebrahimi, "Synthesis and Characterization of Electrodeposited Nanocrystalline Nickel-Iron Alloys," *Materials Science and Engineering*, 2003, Vol. A347, pp. 93-101.
4. F. Ebrahimi and H. Li, "Tensile Deformation and Fracture of Nanocrystalline FCC Metals", to be submitted to *Physical Review Letters*.

Deformation and Fracture of Nanocrystalline Metals

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•International Undergraduate Student

Name: Thomas Truffer

From: Technical University of Grenoble, Grenoble National Engineering School for Physics, Cedex, France

Period: June 1st-August 30, 2003

Project: The Effect of Annealing on the Microhardness of Nanocrystalline Ni-15%Fe Alloy

•REU Program

Name: Nichole Whitney

From: University of Florida, Materials Science and Engineering Department, Gainesville, FL

Period: 2002/2003 Academic Year

Project: The Effect of Thickness on Tensile Elongation of Nickel

Presentation: “The Effect of Thickness on Strength and Ductility of Ni Thin Foils”, Symposium on Advances in MEMS and Optical Packaging II, TMS Annual Meeting, February 2003, San Diego, CA.